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DIFFERENCES IN OPPORTUNITIES FOR HEALTH[1]

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One errs only on the side of platitude in pointing out that the average American wishes to postpone the unhappy event of his death as long as possible, and that he sets a high value on spending the intervening time in physical comfort. He is oriented to a civilization wherein sanitation throws a cordon of safeguards about him, and medical science stands by to help him resist the onslaughts of accidents and disease. The one he accepts as operating automatically in the background of his life; the other he calls for when some part of his organism signifies that trouble is brewing. Ask a random selection of individuals what, in their opinion, is the element most necessary to the satisfying life, and the chances are that nine out of ten will answer, "Good health." It is surely due to no accident that our most frequent salutation is "How are you?"

Despite this high value placed on feeling well, an anomalous situation prevails in the application of the personal services which medical science has to offer. While it is generally accepted that there must be numerous halls of learning to which each generation may turn its steps for the purpose of cultivating the mind, public thinking does not include any comparable scheme for promoting health. Illiteracy has become déclassé, but not sickness and disability.

Without a doubt, if health promoting measures were applied on the same broad scale as are educational measures, they would relieve much personal and group misery present in the country today and lighten the financial burdens that illness now lays upon society. A talented Robert Louis Stevenson, stricken with tuberculosis, may yet meet life so charmingly that the children of his mind survive him as a boon to millions of people. But the day laborer suffering from the same disease may bequeath his physical children, perhaps also infected, to society for support.

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Chief among life's ironies one might point to the spread of sickness among those who possess few of the comforts of existence. This controverts a certain superficial opinion, now on the wane, that the poor, through some mysterious immunity arising from poverty, preserve their health, while the rich riotously throw theirs away. The poor may not suffer from diabetes to the same extent as do the rich, but the consensus of a large number of surveys shows that there is much excess of sickness among the poor and relief families from tuberculosis, pneumonia, nephritis, and rheumatism. The rate for disabilities from other important diseases and from accidents is also higher among the poor.

Surveys of health have long indicated that illness rates in general are highest among the poor and decline with increasing income.

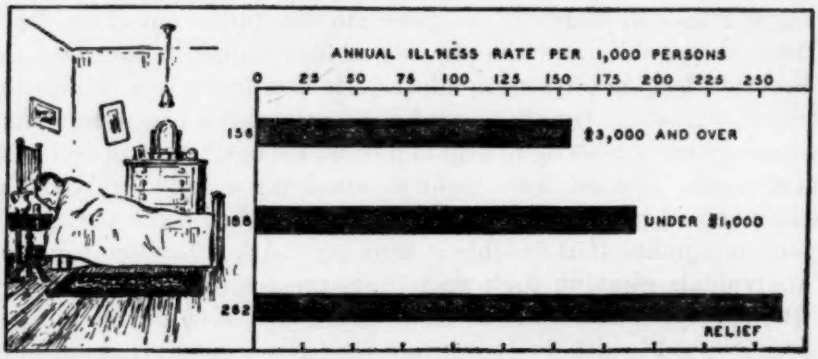

FIGURE 1.—Frequency of illness per annum among members of families in selected income brackets.

One study of 9,000 families in 18 States showed that wage-earners in families having less than $1,200 annual income lost more than twice as many days per person per year as did gainful workers in families whose income was more than $3,000 (*1*). The loss of even a day's wages to a laborer's family may spell distress, whereas among those families in the second group it may be of very little moment.

Inquiries made during the past few years have penetrated into the wide strata of relief families and reveal that the total illness rate of the poor on relief definitely exceeds that of the poor who are not on relief. By using inability to work for 7 days or longer as a measure of illness, it was found through a survey of 280,000 persons in 8 large cities that a total illness rate of 156 cases per 1,000 persons prevailed among families having annual incomes of $3,000 or more, as compared with rates of 188 for families with annual incomes of less than $1,000, and 262 for families receiving public relief (*2*). These figures indicate a concentration of poverty, sickness, and general misery to an extent that most individuals not directly experiencing them would find hard to imagine.

Mortality rates by broad occupational groups also reveal that sickness tends to camp among those who are least able to put up with it. In the United States, for instance, the death rate from pulmonary tuberculosis among skilled laborers is nearly three times what it is among professional workers, and among unskilled laborers it is seven times the rate for professional men. Other occupational groups fall between these extremes. The mortality rate for pneumonia among unskilled workers is three and one-half times the rate among professional workers. The same statement holds true for accidents. Mortality rates from cancer and from heart and kidney diseases, on the increase as the average span of life is lengthened, show an excess of 30 to 50 percent for laborers as compared with higher salaried people. The death rate from all causes is about 25 percent higher for skilled laborers than it is for those in intellectual pursuits, and for unskilled laborers it is more than 100 percent higher (*3*).

The poorer classes also experience greater loss through infant deaths than do those better off. In a recent study made in Denver it was found that infants in families with an annual income of less than $500 died at a rate of 168 per 1,000 live births, as contrasted with 30 per 1,000 in families having incomes of $3,000 or more (*4*). The whole problem of caring for the infant and the mother, of reducing the mortality and morbidity rates of both, demands a confluence of medical, public health, social, and economic measures.

All these measures enter into the problem of clearing up the unwholesome conditions of existence; now one and then another stands out as being at the moment most important. One family may stand in need of actual medical care, while their next door neighbors find their troubles best eased through the help of an experienced social worker. Poor housing, insufficient food and clothing, overfatigue, worry, disease, all enter into the picture. Medicine cannot be offered as a cure-all. It cannot be counted upon to combat successfully diseases directly contingent upon social causes. It can, however, do an enormous amount of good. But there exists between the science of medicine and a large sector of the public an obstacle marked "Ability to pay." Only a relatively small proportion of those who have no money and are in need of help find their way around it.

Any one who lets himself be aware of the unpleasant side streets of existence is able to cite offhand the sort of personal dramas that take place under this scheme of distribution. A mother who has to exercise financial legerdemain to keep the landlord and grocer in good humor simply cannot get the money together for an adenoid operation for little Stella. The child goes on breathing through her mouth and adding to the several factors which alter the proper contours of her face; thus she is being marked for that particularly piercing humiliation which comes to those who do not conform to the norm in physical

appearance. A shop worker whose wages are perpetually attached experiences fever, sweating, and lassitude but puts off going to the doctor with "maybe next month we can spare the money." When he has reached the point of going to a physician, tuberculosis is well advanced and the man has also reached a milestone in his shortened life beyond which he will never earn wages again.

Surveys that have been made express the same facts in a quantitative way. They show that the poor receive less medical care per person and much less per case of illness than do those in more fortunate circumstances. Even among families financed on a modest scale, the percentage of illnesses attended by a doctor increases noticeably with small differences in income. Among the 29,000 persons surveyed in 7 large cities, 59 percent of the illnesses causing inability to work were attended by a doctor in families with an income of less than $150 per capita per annum, while 71 percent were attended

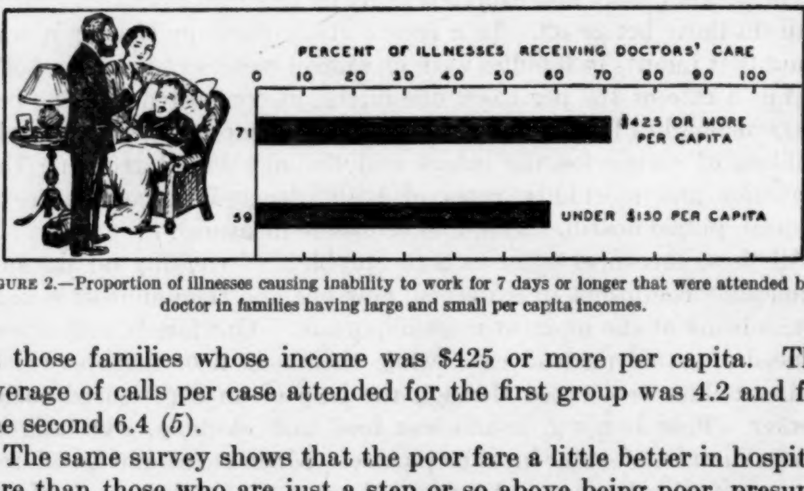

FIGURE 2.—Proportion of illnesses causing inability to work for 7 days or longer that were attended by a doctor in families having large and small per capita incomes.

in those families whose income was $425 or more per capita. The average of calls per case attended for the first group was 4.2 and for the second 6.4 (*5*).

The same survey shows that the poor fare a little better in hospital care than those who are just a step or so above being poor, presumably because of a fair supply of free hospital beds in large cities where the studies were made. It is the family that has sufficient income to meet the ordinary necessities but not enough for expensive hospital costs that feels the pinch most when one of its members needs to go to the hospital (*6*).

The number of surgical operations, as might be expected, varies with income, especially those which are not necessarily of an emergency character but which should be performed some time. Among the poor a convenient time seldom arrives for surgery that is not absolutely necessary.

In the survey of 9,000 families in 18 States surgical operations of all kinds were recorded. Among families with annual incomes of less than $1,200, the data showed 52 operations per 1,000 persons as compared with 94 in families with $5,000 or more (*7*). This excess of 81

percent carries implications of long chances being taken by many a small wage-earner on remaining alive and well.

The rates for tonsillectomies were approximately the same for families with incomes up to $2,000, but among those whose incomes ran above $2,000 the frequency of this operation increased regularly according to salaries. Rates for appendicitis operations increased less markedly with income, but the rate among those receiving more than $5,000 a year was well above that for those living on $1,200 or less a year. Operations on benign tumors varied largely with income. The rate in the $5,000 and over income group was about six times that among families with incomes under $1,200. Thus, poverty is seen to operate directly against one of the chief admonitions to the public in the program for cancer control—"At the first sign of a lump or growth in your body, see a physician." The cancer death rate, be it noted, is now considerably higher among those in the lower income brackets than among those in the higher (*7*).

A simple emergency operation commonly required by young children is puncturing of the eardrum in cases of infection of the middle ear. If this surgical procedure is not applied, the eardrum usually bursts, after some damage has been done to the ear, but not infrequently the infectious process extends to the mastoid cells or to the meninges, in which case life may be endangered. The frequency of this operation, too, shows wide variation with income (*7*).

As to those medical services which are preventive rather than remedial, that part of the public within financial reach of medical care probably does not realize the extent to which many are forced to do without commonly accepted measures of prevention.

Periodic physical examinations might be classed offhand as a luxury of those who have money over and above their needs, and the available data bear this out. The situation among school children as expressed by gross examination rates is somewhat masked because of the volume of service of this type performed in the schools. As age increases between 15 and 45 years, the frequency of physical examinations decreases in the low income groups but tends to increase slightly among those with more means. Particularly large is the variation with income in the examination rate in the older age groups. For the ages 45 years and over, the highest income group had a physical examination rate that was more than 15 times the rate in the lowest income class (*8*).

The extent to which the younger age groups are protected by immunization is probably greatly misinterpreted. Since these services are usually performed under the supervision of the health department or the school authorities, it is easy to assume that they are distributed to one and all. Available data, however, show that these preventive measures also vary with income. In the school

ages, where immunization has become largely a public function, little difference shows up in the frequency of this procedure for the various income groups. In the preschool ages, however, there appears great disparity in the volume of service described as smallpox vaccinations and diphtheria immunizations. Diphtheria immunization is particularly important in the preschool age, for the peak of the death

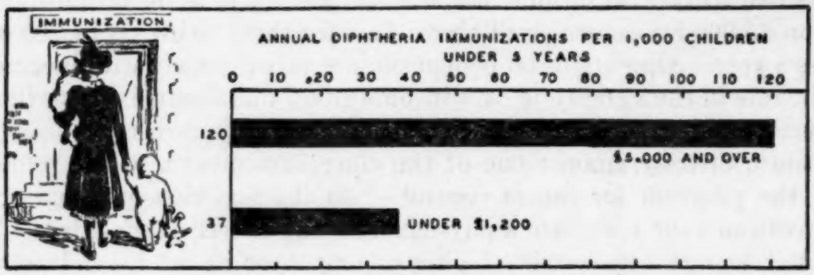

FIGURE 3.—Annual diphtheria immunizations per 1,000 children under 5 years in families of selected income brackets.

rate from this disease occurs before children enter school. Yet in those early ages immunizations were three times as frequent among children from families with annual incomes of $5,000 or more than they were among children from those families with less than $1,200 income. Approximately the same ratio for smallpox vaccinations prevailed in the preschool ages between these income groups (*9*).

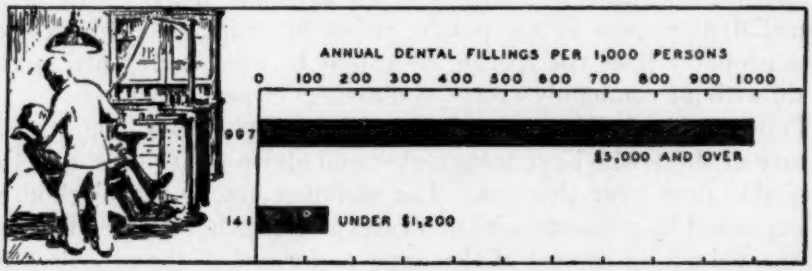

FIGURE 4.—Annual rate of dental fillings received by members of families in selected income brackets.

As to dental care, its value is so widely recognized that probably little notion of how many must go without it exists among those who allow for it in their budgets. Probably no other form of medical care is so completely denied the individual in the under-privileged classes. The immediately important fact is not that reparative dentistry would improve the appearance but that it is a vital element in the prevention of tooth loss and several serious diseases. While the filling of cavities in the teeth is not the complete and final answer to the problem of dental caries, the repair of dental decay is the most efficient way now known to arrest that decay and is a service which should not be denied to any person.

The same study of 9,000 families in 18 States revealed a woeful lack of dental care in the low income brackets. Dental fillings were made at a rate of 141 per 1,000 persons in families with less than $1,200 annual income, as compared with 997 in the income group of $5,000 and over. Reconstructive work was done eight to ten times more frequently in the higher income groups than among the low income families (*10*). It is not possible to explain this on the grounds that the well-to-do may need more care. Such data as are available, on the contrary, indicate that the need for care is greatest among the poor. Nor is it reasonable to assume that the poor are not as interested in dental services. In many a modest home it is accepted that as the children get through school and find work they will have their teeth "fixed up." Frequently, however, it is too late for the dentist to do more than stave off the ravages of decay a bit longer.

HEALTH FACILITIES

The lineup of the opposing forces, diseases and their scientific antagonists, seems a bit illogical, considered from the detached point of view, with medical measures reaching in the least degree those who need them most. The situation, of course, like many another is simply an outgrowth of public thought. The attitude toward public facilities for health has not been conditioned to the same degree of expectation as has the attitude toward institutions for achieving justice or education. A man does not usually rely upon the invisible powers that be to send him justice at law. Nor does he seek his education solely from books. He takes it for granted that judges and teachers are available to him in the proper public buildings and that it is to this end that tax moneys are paid into governmental exchequers.

The promotion of health, however, is not generally accepted as a major interest of government. True it is that there exist many more centers of public health activity now than there were at the beginning of this century, but a few indices will show the great inadequacy of what is being done as compared with what is needed.

A health department, the symbol of disease prevention in any community, may be appraised by the scheme of organization and by the amount of funds at its disposal. By these criteria, it is apparent that even the best of departments are not in a position to give reasonable application to what is known regarding the prevention of disease and promotion of health. Of 2,500 predominantly rural counties in the United States, only 738 employed full-time health officers in 1935, and after a year under the Social Security Act the number was only 946 in 1936 (*11*). The other rural counties depend on local practicing physicians, and in some instances on untrained laymen, for the administration of such rudimentary service as may be provided.

With respect to the employment of qualified health officers, the average performance of cities is no better than that of counties.

Most students of public health administration agree that an annual budget equivalent to $2 per capita is required for the preventive services commonly assigned to the health department. This level of public support is seldom reached. In fact, most county health department budgets fall below 50 cents, and only occasionally is a city reported to have appropriated more than $1 per capita (*12*).

Public health programs are particularly remiss in the field of illness that is unattended or only partially attended. Care of the mentally afflicted and the tuberculous is now generally accepted as a function of government. Otherwise public medical service is usually restricted by the terms of the law to those who are accepted as public charges. Budgetary perhaps more than legal restrictions now serve to confine public medical service, particularly of the home and office type, to a very small fraction of the population who might benefit therefrom.

Aside from the regular avenues of public health activity, there are, it is true, establishments where the poor may receive medical treatment. The actual number of such places is often magnified by those who refer to them with optimistic vagueness and with a dismissing wave of the hand for the whole problem of the low income and dependent groups. This rather grand idea of the extent of twentieth century benevolence has given rise to the oft repeated statement that the poor are treated as royally as the rich. The actual facts, however, reveal a rather different picture of the scope of free medical care.

Out-patient departments of hospitals are relatively few in number and for the most part are located in large cities. In all, about 770 hospitals have units that might be classed as true out-patient departments organized to serve the very low income group of the population (*13*). While it is true that many other hospitals give some care to their discharged patients and others who seek treatment of an emergency character, such service for ambulatory patients is not to be confused with that rendered in an organized out-patient department.

Hospitalization in general has this decided relationship to economic status—it is available for the most part only to those who can pay for it. This is putting the situation broadly and bluntly, and excludes certain disorders which are accepted as a public responsibility and will be considered separately. Eighty-five percent of all general and allied special hospitals are nongovernmental, and they depend for about three-fourths of their income upon fees from patients (*14*). It stands to reason that individuals of some financial status occupy most of the beds.

The distribution of hospitals gives the people of certain sections an advantage in the securing of institutional care. Generally speaking, they are concentrated in the more populous counties. In the South

and West where the urbanization is less, the average distance to hospitals is greater than in the North and East. This factor of distance to be covered probably decides on many occasions whether there shall be hospitalization, especially among the poor and the nearly poor.

One striking exception to the direct relationship between hospitalization and the income of the sick is the category of mental disorders. Public care of those who are mentally ill, once a highly controversial subject, is now almost an article of political faith. To the public mind it is fitting and necessary that there be institutions erected and maintained out of tax moneys to take care of the mentally incompetent members of society.

Mental hospitals of the United States show a total of some half million beds, of which but 4 percent are nongovernmental. More than 95 percent of the beds in these tax-supported hospitals are reported occupied. Many of the government institutions report acceptance of patients beyond their rated capacity for taking care of them (*15*).

Specialists in the field of mental disorders, viewing the work at close range and with the critical attitude of the perfectionist for his chosen subject, are impressed with the immense amount of work yet to be done. They are justly disturbed by the overcrowding and the frequent failure to utilize all that medical science has to offer in this field. In a review of the general subject of hospitalization, however, that part which has to do with mental disorders stands out in high relief through the substantial way in which the burden of care has been transferred from the family to the institution.

Another exception to the general concentration of hospital treatment among those who have the means to pay for it is in the care of the tuberculous. Society's acceptance of responsibility in the treatment of tuberculosis is largely a growth of the twentieth century. So also is individual willingness to admit the condition and seek the proper place for care. Growing confidence in the curability of this disease, efforts of benevolent citizens to secure adequate care for tuberculous patients, the passage of laws to this end, and the growth of sanatoria have all combined to mold public opinion to the eminently sane conclusion that a tuberculous person without means should be able to go to a place of cure provided by the government and stay there until he is well.

The specialist in this field, too, points to the mountain of need that is still to be scaled. The facts in the case support his contention that many more beds are needed before the forces opposing this disease reach adequate proportions. Tuberculosis still leads as a cause of death among the young adult group, among the poor, and the colored (*16*). Despite the importance of prompt treatment, more than 80 percent of the cases are in a fairly advanced stage at the time of

hospitalization (*17*). Minimum standards set up for treatment of this disease call for one bed for each annual death, but many of the States have not reached this quota (*18*). However far short of perfect adequacy the endeavors fall, they nevertheless have succeeded in hauling tuberculosis down from its high estate as a leader among the causes of death in 1912 to seventh place in the year 1937.

The case against syphilis has also been receiving special pleading before the bar of public opinion. The population at present is in the evolutionary process of becoming really aware of this disease and its social implications. The incidence of syphilis is enough to alarm the body politic. From data gathered by the United States Public Health Service, it is estimated that one out of ten adults in the United States today has or has had syphilis, many of whom will remain a potential treatment problem throughout life (*19*). If infected persons actually needing treatment followed it up until they had been rendered noninfectious and safe against late manifestations of the disease, present facilities would care for only 30 percent of the present syphilis treatment load.

The problem here is not that of providing institutions but of inculcating the disposition to seek treatment and to follow it up until cured. It is more nearly allied to general medicine than to the special therapy of those who need to be removed from society temporarily or permanently. It touches upon the institutional problem, however, in that syphilis leads so inevitably in many cases to mental disorders. Provision for and utilization of adequate treatment facilities would, it is believed, eliminate 10 percent of first admissions to mental institutions now occurring as a result of syphilis.

SUMMARY

Presentation of data in support of the thesis that opportunities for health are closely coordinated with economic status could be extended indefinitely, for the field is large and work that should result in reducing the differences is just under way. However, sufficient evidence of the inequality of opportunity has been established through the use of statistics which show that illness rates are higher for the poor than for the well-to-do and that general medical care, surgical operations, immunizations, and dental care are impeded by inability to pay. Furthermore health departments and hospitals are not so organized as to render adequate service to those in greatest need.

Tuberculosis and syphilis, being in the nature of scourges, may seem to lead the array of pressing problems, but the many other matters of lesser magnitude contribute to the total of evil consequences which, after all, constitute the essence of the situation which needs to be attacked. The force and the effects of the attack will depend very largely upon the answers to these questions: What trends

will public thinking follow? How much responsibility will the social conscience accept? Possible changes in public thought on the subject of health are not contemplated in this discussion. It is well to recognize, however, that social action in the field of human health is not in keeping with the aphorisms that presumably express avowed interest.

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CONTAMINATION OF PASTEURIZED MILK BY IMPROPER RELATIVE PRESSURES IN REGENERATORS

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INTRODUCTION

Many of the larger milk pasteurization plants employ regenerators (also known as heat exchangers or regenerative heater-coolers) in which a continuous flow of hot pasteurized milk on one side of a metal partition warms the incoming raw milk on the other side. This in brief is the principle of the milk-to-milk regenerator. Another type is the milk-to-water-to-milk regenerator, in which the pasteurized product transfers its heat to a circulating water medium which in turn warms the raw milk. Pasteurized milk must be cooled before bottling, and, conversely, the raw milk, which has been kept cold during transit and storage, must be heated for pasteurization. Hence heat exchange by means of regenerators permits a substantial saving in heating and refrigeration costs.

Such equipment is of concern to health officers because of the danger of contamination of the pasteurized product by the raw milk in case flaws develop in the metal or the joints separating the two. Raw milk must be considered a potential source of pathogenic bacteria. Much of the value of pasteurization is lost if the product subsequent to pasteurization is subjected to possible contamination by raw milk. To combat this danger, control regulations frequently include provisions similar to the following, quoted from the Public Health Service Milk Ordinance and Code (Public Health Bulletin No. 220, 1936 edition, p. 101):

> Regenerative heater-coolers shall be so constructed and operated that, in the case of milk-to-milk regenerators, the pasteurized milk will at all times, including shut-down periods, be kept under higher pressure than the raw milk, and, in the case of milk-to-water-to-milk regenerators, the heat-transfer medium will at all times, including shut-down periods, be kept under higher pressure than the raw milk.

In the case of milk-to-water-to-milk equipment the intent of such a requirement is to prevent the raw milk from contaminating the heat-

transfer medium, which in turn could contaminate the pasteurized product. The heat-transfer water, for which a potable supply must be used and which is confined in a closed circuit and is periodically reheated by the pasteurized milk, will not contaminate the latter unless such medium has first been mixed with raw milk. The pasteurized product could also be properly protected by requiring that it be kept at all times under higher pressure than the heat-transfer water, but this alternative method would not prevent the objectionable fouling of the water by the raw milk if flaws developed in the metal or the joints between them.

The methods for securing compliance with such a regulation are of a technical nature. The explanation accompanying this regulation in the Public Health Service Milk Code suggests certain procedures, but more recent study has demonstrated their inadequacy. It is the purpose of this paper, therefore, to fill the need for such detailed objective specifications as will enable control officials to determine readily whether the relative-pressure requirements are satisfied in the various types of regenerator hook-ups.

PRESSURE GAGES

Relative pressures may obviously be determined by means of pressure gages, or a differential pressure gage, or other pressure-indicating devices.

When gages are employed they should be located at the critical-pressure points of the regenerator, i. e., (1) at the raw-milk inlet, and (2) either at the pasteurized-milk outlet in the case of milk-to-milk regenerators, or at the heat-transfer-medium outlet from the raw-milk section in the case of milk-to-water-to-milk types. Counter-current flow is practically universally used in regenerators because of its greater heat-exchange efficiency. With counter-current flow, points (1) and (2) are always at the elevation where the pressure on the pasteurized-milk (or the heat-transfer-medium) side, if greater than that on the raw-milk side, exceeds the latter by the least amount. This is true for all types of regenerators, with either or both sides closed to the atmosphere, at all times while milk is in the regenerator, irrespective of whether the raw milk enters at the top or the bottom. For any side open to the atmosphere, a pressure gage is, of course, unnecessary.

Pressure-indicating devices will not indicate compliance or non-compliance with the relative-pressure requirement between inspections. Pressure-recording devices would overcome this objection by furnishing the inspector with a graphic history of the pressures. Aside from their high cost, such gages are likely to be none too sensitive or reliable at the relatively low pressure differentials ordinarily encountered in milk regenerators. A difference of an inch or two in

gravity head between the two sides of a regenerator, which might be sufficient to reverse the pressure relationship during shut-downs, would not be indicated or recorded by the type of gages suitable for milk equipment. Gages would have to be tested for accuracy and sensitivity at frequent intervals. The pressure relationship would have to be determined for every rearrangement of the hook-up, every change in the pumping rate, and every change in equipment and size of piping. But the most serious objection to the use of pressure gages lies in the fact that the health officer would be powerless to remedy any damage that might have resulted from improper relative pressures occurring between inspections.

For these reasons pressure-indicating or recording devices are not recommended and should not be relied upon for determining compliance with the regulation. Instead, control officials should demand hook-ups like the following, which automatically insure the required relative pressures at all times.

MILK-TO-MILK REGENERATORS

Four types of milk-to-milk regenerators are possible. In the most common design both the raw milk and the pasteurized product flow through either a series of connected plates or two concentric

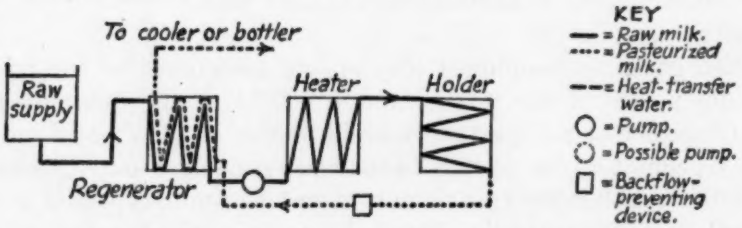


FIGURE 1.—Milk-to-milk regenerator with both sides closed to atmosphere (diagrammatic elevation).

pipes, so that both sides are closed to the atmosphere. In others the pasteurized milk is on the inside of a pipe, while the raw milk flows downward on the outside open to the atmosphere. The third design is like the second, but the raw milk is on the inside and the pasteurized on the outside. In the fourth possible type, not used at present, the raw milk flows downward on one side of a corrugated partition and the pasteurized on the other side, with both sides open to atmospheric pressure.

On *milk-to-milk regenerators with both sides closed to the atmosphere* (fig. 1) the required relative pressures will be automatically insured when the following conditions obtain:

(*a*) The pasteurized milk, between its outlet from the regenerator and its nearest downstream point open to the atmosphere, rises to an elevation higher, by at least 3 percent of the static raw-milk head on the bottom of the regenerator, than any raw milk downstream

from the free raw-milk level nearest upstream from the regenerator, provided that such excess head is at least 6 percent if water or chlorine solution precedes the milk at the beginning of a run; and

(*b*) No pump is located between the pasteurized-milk outlet from the regenerator and the nearest downstream point open to the atmosphere; and

(*c*) No pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*d*) A backflow-preventing device, such as a positive-type pump or a check valve, is installed in the line between the pasteurized-milk inlet to the regenerator and either the nearest upstream point open to the atmosphere or the raw-milk outlet from the regenerator, whichever is farther downstream; provided that if said valve or pump or any portion of the system downstream therefrom leaks, storage for the pasteurized milk shall be provided downstream from its outlet from the regenerator and at the elevation specified in (*a*), either in the pipe line or in a tank equipped with a bottom inlet, equal in volume to at least one hour's leakage; and

(*e*) Hot water or chlorine solution or previously pasteurized milk is pumped through the system until it reaches the elevation specified in (*a*) before any raw milk is admitted to the regenerator.

The reasons for these specifications may not be apparent. If (*a*) is satisfied all pasteurized milk in the regenerator will be under greater pressure than the raw milk, provided (*b*) and (*c*) are satisfied during operation, (*d*) during shut-downs, and (*e*) at the beginning of the run.

The 3 percent excess head provided in (*a*) is intended to compensate, during shut-downs, for the difference in specific gravity between pasteurized milk at 160° F. or more and raw milk at 40° F. or less. Similarly, the 6 percent excess head required when water or chlorine solution precedes the milk at the beginning of a run serves to compensate, during shut-downs occurring at the beginning of a run, for the difference in specific gravity between water at 160° F. or more and milk at 40° F. or less.

A pump located as described in (*b*) could during operation reduce the pasteurized-milk pressure on its suction side to below that of the raw milk in the regenerator.

When the raw milk is sucked through the regenerator, an auxiliary pump provided with slip is sometimes located as described in (*c*), in order to overcome priming difficulties in the main pump and to maintain the raw milk in the regenerator at or above atmospheric pressure so as to avoid sucking in air. A raw-milk supply tank with its milk level higher than the regenerator at the beginning of the run would overcome priming difficulties, and placing the entire tank higher than the regenerator would attain both objectives, thus eliminating the

need for an auxiliary pump. A raw-milk pump upstream from the regenerator could increase the raw-milk pressure to above that of the pasteurized milk in the regenerator during operation even if (*a*) and (*b*) were satisfied. It is possible to avoid this objection by placing in the pasteurized-milk line downstream from the regenerator a sufficient gravity head or pressure-increasing restriction, as by means of a valve. Whether such gravity head or restriction is sufficient to accomplish its purpose would have to be determined for each installation and for every change in the hook-up by means of pressure gages. Proper relative pressures could not be automatically insured.

The positive-type pump or the check valve specified in (*d*) will prevent backflow of the pasteurized milk through the regenerator, provided no leakage occurs. A flow-diversion valve cannot be relied upon to prevent backflow during the first few minutes following a pump shut-down while the milk is still at a sufficiently high temperature to keep the diversion valve in the forward-flow position. Backflow would lower the level of the pasteurized milk during pump shut-downs and thus might reduce its pressure to below that of the raw milk in the regenerator. The first alternative location for the device applies to systems with pasteurizer-holders or other intermediate tanks open to the atmosphere; the second, to completely closed systems. The second provision of (*d*) will insure an adequate pasteurized-milk pressure throughout a shut-down of at least 1 hour's duration, even if there is some backflow due to leakage. Shut-downs of such duration are infrequent. The adequacy of the storage provided to compensate for leakage should be checked occasionally by determining, by means of a petcock installed in the line, a sterile probe, or otherwise, whether the pasteurized milk in the line has fallen below the level specified in (*a*) after a pump shut-down of 1 hour.

At the beginning of a run the raw milk in the regenerator may be under greater pressure than the pasteurized-milk side from the time the raw milk enters the regenerator until the pasteurized milk has risen to the elevation specified in (*a*) downstream from and above the regenerator. The procedure described in (*e*) will overcome this danger. Water or previously pasteurized milk preceding the milk will temporarily provide the necessary pressure on the pasteurized-milk side until replaced by the freshly pasteurized milk.

On *milk-to-milk regenerators with only the raw milk open to the atmosphere* (fig. 2) the required relative pressures are automatically insured when

(*a*) The pasteurized milk, between its outlet from the regenerator and its nearest downstream point open to the atmosphere, rises higher than the top of the regenerator; and

(*b*) No pump is located between the pasteurized-milk outlet from the regenerator and the nearest downstream point open to the atmosphere; and

(*c*) A backflow-preventing device, such as a positive-type pump or a check valve, is installed in the line between the pasteurized-milk inlet to the regenerator and either the nearest upstream point open to the atmosphere or the raw-milk outlet from the regenerator, whichever is farther downstream; provided that if said valve or pump or any portion of the system downstream therefrom leaks, storage for the pasteurized milk shall be provided downstream from its outlet from the regenerator, either in the pipe line or in a tank equipped with a bottom inlet, at a higher elevation than the top of the regenerator, equal in volume to at least 1 hour's leakage; and

(*d*) Hot water or chlorine solution or previously pasteurized milk is pumped through the system until it reaches the elevation specified in (*a*) before any raw milk is admitted to the regenerator.

The reasons for these specifications are similar to those for the preceding type. In both designs the purpose is to maintain the pasteur-

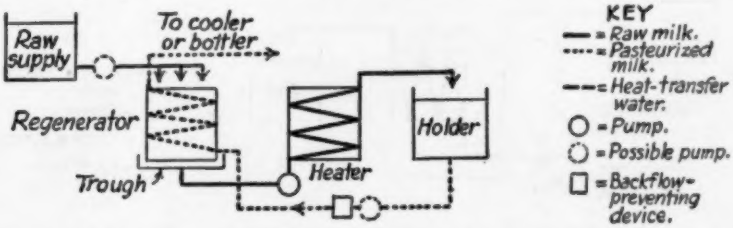


FIGURE 2.—Milk-to-milk regenerator with only raw milk open to atmosphere (diagrammatic elevation).

ized product under greater pressure than the raw at all times, the only difference being that where the raw milk is open to the atmosphere the pasteurized milk need be kept only above atmospheric pressure rather than at a higher level than all raw milk in the system. If (*a*) is complied with all pasteurized milk in the regenerator will be under greater pressure than atmospheric, provided (*b*) is satisfied during operation, (*c*) during shut-downs, and (*d*) at the beginning of the run. In this type there is no objection to a raw-milk pump upstream from the regenerator, since the raw-milk side is open to the atmosphere and cannot be above atmospheric pressure.

Milk-to-milk regenerators with only the pasteurized milk open to the atmosphere (fig. 3) should not be approved, since no conditions are apparent which will insure that all of the raw milk in the regenerator will be maintained at subatmospheric pressure (i. e., at lower pressure than the pasteurized milk) throughout a shut-down.

Even with a raw-supply tank below the bottom of the regenerator and no pump between the two, any air sucked into the line between

the raw-milk inlet to the regenerator and the pump nearest downstream therefrom could, during a shut-down, soon destroy the suction and increase up to atmospheric (or even above atmospheric in plate-type regenerators) the pressure on the raw-milk side of the regenerator.

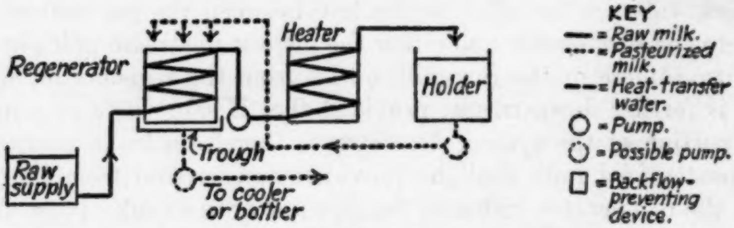


FIGURE 3.—Milk-to-milk regenerator with only pasteurized milk open to atmosphere (diagrammatic elevation).

Milk-to-milk regenerators with both sides open to the atmosphere (fig. 4) should not be approved, since with both sides at atmospheric pressure the pasteurized-milk side cannot ever be under greater pressure than the raw-milk side. This type of regenerator is not, however, being used nor is it likely to be used because of its inefficiency. It is subject to large heat losses to the atmosphere, and as the raw milk and the pasteurized milk must both flow downward it cannot utilize counter-current flow.

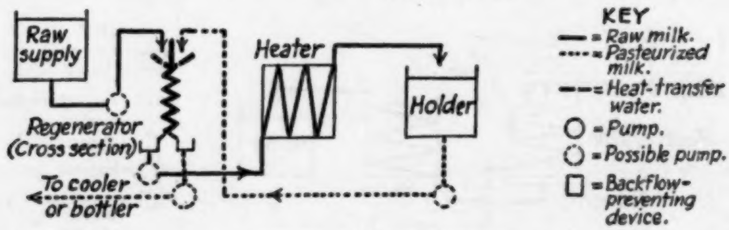


FIGURE 4.—Milk-to-milk regenerator with both sides open to atmosphere (diagrammatic elevation).

MILK-TO-WATER-TO-MILK REGENERATORS

Many types of milk-to-water-to-milk regenerators could be designed, but only the two types on the market will be discussed. The number of possible combinations may be gaged by the fact that in either or both the raw-milk and the pasteurized-milk sections both the milk and the heat-transfer medium may be either open or closed to the atmosphere. In connection with the relative-pressure requirement, conditions existing in the pasteurized-milk section are immaterial and only the raw-milk section need be considered.

On milk-to-water-to-milk regenerators with both the milk and the heat-transfer water in the raw-milk section closed to the atmosphere (fig. 5) the required relative pressures are automatically insured if—

(*a*) The highest point of the heat-transfer-water circuit is in a covered tank at an elevation higher, by at least 6 percent of the static raw-milk head on the bottom of the regenerator, than any raw milk downstream from the free raw-milk level nearest upstream from the regenerator; and

(*b*) No heat-transfer-water pump is located upstream from such tank but downstream from the heat-transfer-water inlet to the raw-milk section of the regenerator; and

(*c*) No milk pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*d*) The heat-transfer-water circuit is full of water at the beginning of the run, and all loss of water from the circuit (through backsiphon-

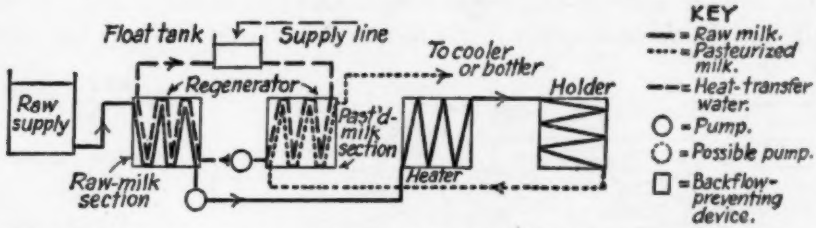


FIGURE 5.—Milk-to-water-to-milk regenerator with both milk and water in raw-milk section closed to atmosphere (diagrammatic elevation).

age, open drain valve, leakage, evaporation, etc.) is prevented or automatically and immediately replenished whenever raw milk is present in the regenerator.

Most of these requirements and the reasons therefor are similar to those already discussed for milk-to-milk regenerators with both sides closed to the atmosphere. Compliance with (*a*) will place all of the heat-transfer water in the raw-milk section of the regenerator under greater pressure than the raw milk at all times, provided (*b*), (*c*), and (*d*) are also satisfied. The excess head specified in (*a*) for the heat-transfer-water circuit will compensate, during shutdowns, for the difference in specific gravity between milk at 40° F. or less and water at 160° F. or more.

A heat-transfer-medium pump located as described in (*b*) could, when operating, reduce the heat-transfer-water pressure on its suction side to below that of the raw milk in the regenerator. A milk pump located as shown in (*c*) could during operation increase the raw-milk pressure to above that of the heat-transfer water in the regenerator even if all other requirements were satisfied.

The full heat-transfer-water circuit required at all times by (*d*) is considered the simplest means of insuring proper relative pressures. The heat-transfer-water pump could, when operating, satisfy the pressure requirement even if the circuit were not full; but when not

operating it will not satisfy this requirement unless there is enough water in the circuit to fill the upstream portion between the pump and the tank, and unless all backflow and loss of water from this portion of the circuit are prevented. The most practical solution is, therefore, a constant-level tank at the highest point specified in (*a*). A covered tank will protect the water against contamination, but the cover should not be airtight. Although the float in the tank will automatically open the supply-line valve whenever any loss of water from the circuit occurs, the drain valve should be kept closed throughout the day's run to avoid unnecessary risks. The tank should be supplied with an overflow, and all supply lines feeding the heat-transfer-water circuit should enter at the tank and through a sufficient air gap to prevent loss of water through backsiphonage into the supply line.

On *milk-to-water-to-milk regenerators with the water closed but the milk open to the atmosphere in the raw-milk section* (fig. 6) the required

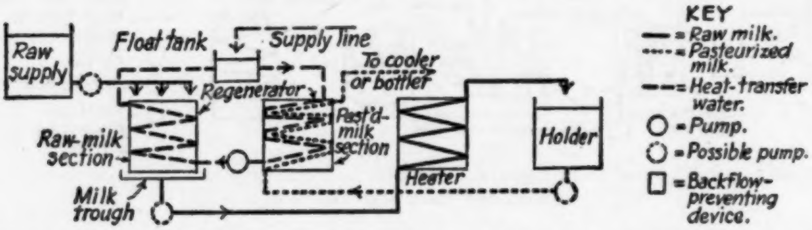


Figure 6.—Milk-to-water-to-milk regenerator with water closed but milk open to atmosphere in raw-milk section (diagrammatic elevation).

relative pressures are automatically insured when the following conditions are satisfied:

(*a*) The highest point of the heat-transfer-water circuit is in a covered tank at a higher elevation than the top of the raw-milk section of the regenerator; and

(*b*) No heat-transfer-water pump is located upstream from such tank but downstream from the heat-transfer-water inlet to the raw-milk section of the regenerator; and

(*c*) The heat-transfer-water circuit is full of water at the beginning of the run, and all loss of water from the circuit (through backsiphonage, open drain valve, leakage, evaporation, etc.) is prevented or automatically and immediately replenished whenever raw milk is present in the regenerator.

These specifications and the reasons therefor are almost identical with those of the type immediately preceding, except that the raw-milk pump upstream from the regenerator is not prohibited since the raw-milk pressure in this type of regenerator cannot exceed atmospheric.

ACKNOWLEDGMENTS

The valuable aid of Senior Sanitary Engineer L. C. Frank and Assistant Public Health Engineer W. N. Dashiell in reviewing the manuscript and suggesting revisions is appreciated.

SUMMARY

Milk regenerators, in which the hot pasteurized milk heats and is cooled by the cold raw milk either directly or through an intermediate water circuit, may permit contamination of the pasteurized product by the raw milk in case flaws develop in the metal or the joints separating the two. To combat this danger, control regulations usually require that the pasteurized milk (or the heat-transfer water) be under greater pressure at all times than the raw milk.

Objective criteria are presented to enable control officials to determine whether such regulations are satisfied. Methods are described for automatically insuring the required relative pressures in various types of milk-to-milk and milk-to-water-to-milk regenerators.

THE EFFECT OF CERTAIN SMALL FILTERS ON PLATE COUNTS OF WATER PASSING THROUGH THEM

By ARTHUR B. CRONKRIGHT, *Project Supervisor*,[1] and ARTHUR P. MILLER, *Sanitary Engineer, United States Public Health Service*

From April 6, 1936, to June 30, 1937, the Public Health Service served as sponsor for Works Progress Administration project No. 265–6910, having as its aim the inspection of plumbing in Federal buildings in New York City and Detroit to detect hazards to the public health. In the course of this work in New York City, certain piping arrangements and fixtures were found which required study beyond that which would be given under the normal routine of the project. In this category was a group of small stone filters used to clarify water supplied to bottle-type water coolers situated in various buildings. The results of the special work done on these filters is here described.

For ready identification, the filters will be referred to by letter, as *A*, *B*, etc. Of the eight filters considered here, the first five (*A–E*) were connected to the same source of drinking water, and the other three (*F–H*) to another one. Filters *A–E* were identical and filters *F–H* were slightly larger than those in the first group (*A–E*).

The procedure followed in this work was very simple. It consisted of taking a sample of water from the line leading into the filter and then, at once, a second sample at the filter outlet. On filters

[1] Formerly project supervisor, Works Progress Administration.

F, *G*, and *H*, the control samples from the influent were secured at the nearest fixture to the filters, namely, a slop sink situated about 6 feet ahead of the filters on the same pipe line. All samples were collected by trained personnel in accordance with good sampling technique and were tested within 2 hours after collection to determine the number of bacteria per milliliter growing on nutrient agar at 37° C. for 24 hours, by the procedures outlined in Standard Methods of Water Analysis of the American Public Health Association (8th edition, 1936), in the laboratory connected with the project and under the direction of a qualified bacteriologist.

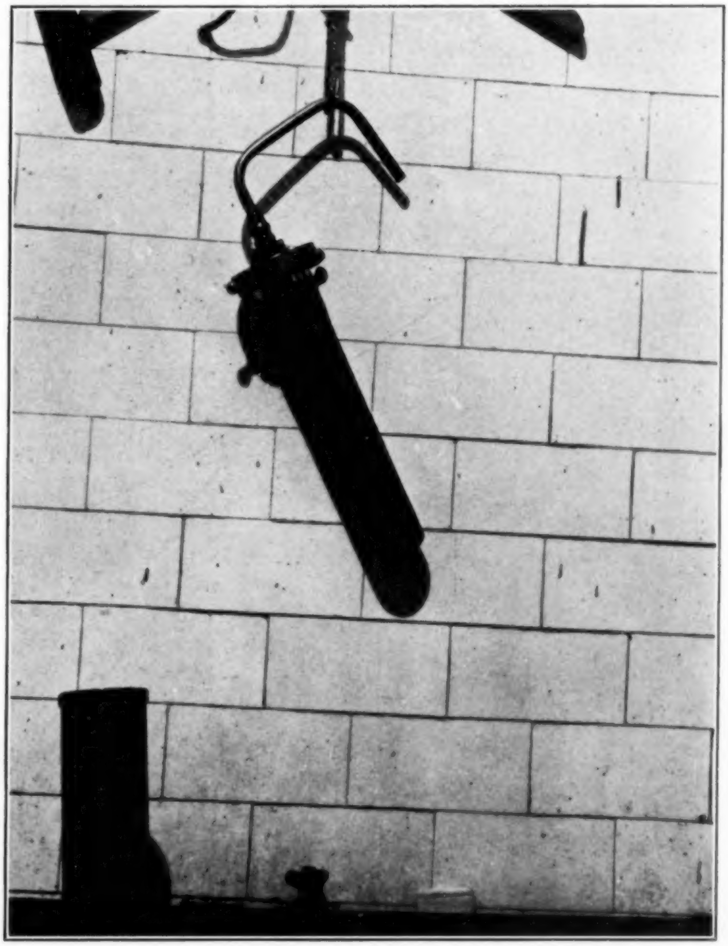
TABLE 1.—*Averages of bacteria counts per milliliter for each filter*

Filter	Number of samples from each filter	Influent	Effluent	Percent increase	Filter	Number of samples from each filter	Influent	Effluent	Percent increase
A[1]	2	24	2,070	8,500	*E*[2]	10	45	101	125
B	9	9	3,154	34,900	*F*	5	8	1,052	13,100
C	9	20	611	2,950	*G*	5	8	22	175
D	10	288	55	−81	*H*	5	8	26	225

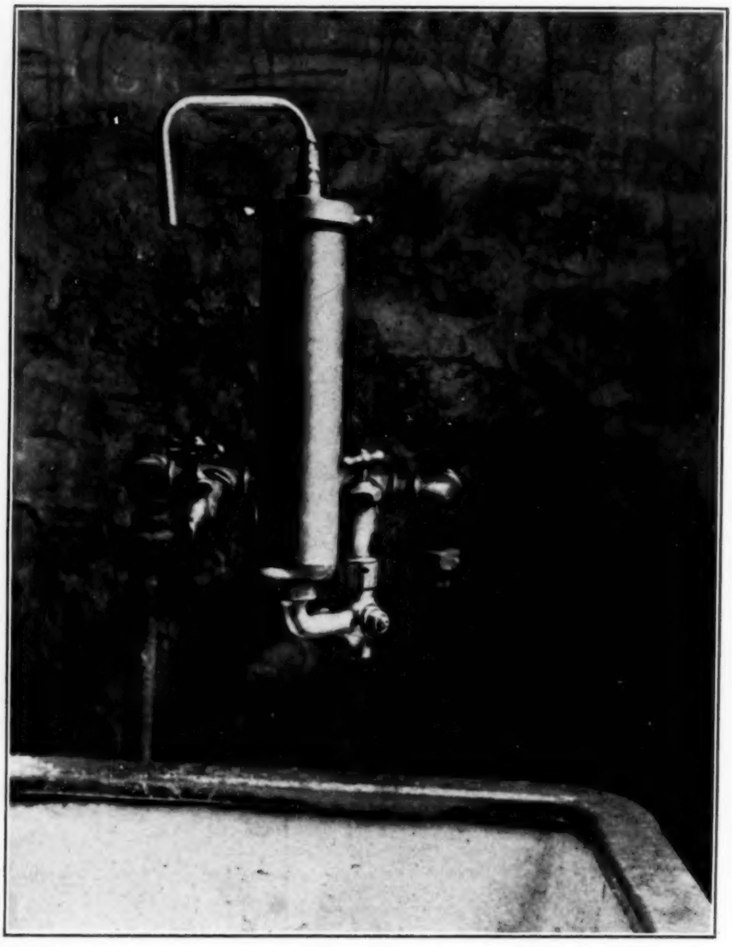
[1] This filter was removed after the second test.
[2] Tests of scrapings from this filter gave a count of 2,300,000 bacteria per milliliter growing on agar at 37° C. for 24 hours.

In some cases where effluent plates were crowded with colonies, due to counts being much higher than anticipated, estimates based on partial counts were made. The results on filter *D* do not parallel those on the other filters, on account of a single high influent count. Because of the small number of samples taken, this single result has an unmerited influence on this average. Excluding this one sample, the average count for the influent on this filter would have been 9 bacteria per milliliter. For every filter except *D*, the average results on the effluent are higher than those on samples of the influent. Excluding the high sample heretofore mentioned, the average for *D* effluent would be 58 bacteria per milliliter as opposed to 9 in the influent, or an increase of 544 percent. One sample of scrapings from the stone in filter *E* was taken. The resultant number of bacteria per milliliter growing on agar at 37° C. for 24 hours was 2,300,000.

Water passing through these filter stones leaves most of its undissolved substances on the stones' surface. These substances, apparently, are organic in nature as well as inorganic and provide any included bacteria with an abundant food supply. Multiplication takes place, and, eventually, if the stone is not replaced or cleaned, it becomes completely impregnated with bacteria. After that condition is reached, the filter stone gives off to the water passing through it more bacteria than it removes. The percentages of increase in the number of bacteria in the effluent as shown in table 1 adequately confirm this opinion.



Photograph showing dirty condition of stone in filter C.



Filter D.

SUMMARY

Bacteriological examinations of samples of drinking water taken before and after filtering through a certain type of stone filter in several public buildings in New York City show that these filters very measurably increase the plate counts of water passing through them under the operating conditions obtaining in those buildings at the time of sampling.

DEATHS DURING WEEK ENDED MARCH 12, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 12, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	9,057	9,557
Average for 3 prior years	9,608	
Total deaths, first 10 weeks of year	89,544	104,715
Deaths under 1 year of age	559	606
Average for 3 prior years	629	
Deaths under 1 year of age, first 10 weeks of year	5,406	6,407
Data from industrial insurance companies:		
Policies in force	69,759,312	69,403,932
Number of death claims	13,837	15,595
Death claims per 1,000 policies in force, annual rate	10.3	11.7
Death claims per 1,000 policies, first 10 weeks of year, annual rate	10.1	11.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (......) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 19, 1938, and Mar. 20, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937
New England States:								
Maine	1	2	4	113	202	28	0	2
New Hampshire	0	0	......	......	18	50	0	0
Vermont	1	0	......	......	136	1	0	0
Massachusetts	3	5	......	......	290	864	1	4
Rhode Island	0	1	5	......	9	482	0	1
Connecticut	8	5	3	18	28	658	0	0
Middle Atlantic States:								
New York	34	56	[1] 10	[1] 47	2,293	703	3	14
New Jersey	11	14	25	19	1,401	2,987	1	4
Pennsylvania	42	34	......	......	6,104	322	5	13
East North Central States:								
Ohio	20	24	......	48	1,777	252	1	11
Indiana	38	12	17	85	1,062	60	4	3
Illinois	19	45	14	77	6,382	70	2	8
Michigan [2]	8	13	1	3	5,185	62	0	3
Wisconsin	2	0	40	67	4,959	23	1	2
West North Central States:								
Minnesota	2	5	......	2	62	24	0	0
Iowa	3	3	8	6	133	3	2	1
Missouri	16	15	67	253	1,178	13	1	2
North Dakota	3	2	68	4	28	1	2	0
South Dakota	0	0	2	......	......	2	0	0
Nebraska	1	2	......	4	46	5	1	0
Kansas	3	9	22	40	537	13	0	2
South Atlantic States:								
Delaware	3	0	......	9	32	48	0	0
Maryland [2]	10	8	10	45	97	877	0	4
District of Columbia	7	3	4	2	11	59	0	3
Virginia	24	24	......	......	841	120	3	15
West Virginia	10	9	56	229	483	20	1	12
North Carolina	20	9	24	248	3,254	167	1	1
South Carolina [3]	5	5	242	1,508	316	41	0	5
Georgia [3]	14	5	......	779	483	......	3	2
Florida	66	8	3	14	858	5	3	14
East South Central States:								
Kentucky	13	12	10	119	982	110	6	12
Tennessee [3]	8	12	67	522	998	34	5	13
Alabama	7	8	121	1,874	1,104	14	13	19
Mississippi [2]	3	4	......	......	......	......	0	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 19, 1938, and Mar. 20, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937
West South Central States:								
Arkansas	6	0	98	211	272	-------	2	0
Louisiana [3]	12	18	7	88	5	21	0	20
Oklahoma [4]	6	10	182	287	126	12	1	5
Texas [3]	35	29	511	1,677	128	476	1	8
Mountain States:								
Montana	3	1	-------	25	5	18	0	0
Idaho	0	0	2	4	4	13	0	0
Wyoming	1	0	-------	-------	29	1	0	0
Colorado	12	8	-------	-------	580	4	0	1
New Mexico	9	1	7	33	70	110	0	1
Arizona	1	2	130	30	26	195	0	0
Utah [2]	0	1	-------	-------	439	23	0	0
Pacific States:								
Washington	4	1	7	-------	9	39	0	2
Oregon [5]	1	0	72	51	31	10	0	2
California	30	25	44	311	609	206	3	5
Total	525	450	1,883	8,852	43,622	9,246	66	215
First 11 weeks of year	6,852	5,956	31,577	244,532	330,311	61,922	1,009	1,843

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938
New England States:									
Maine	0	0	26	26	0	0	2	0	69
New Hampshire	0	0	7	21	0	0	0	0	-------
Vermont	0	0	10	8	0	0	0	0	42
Massachusetts	0	0	359	287	0	0	0	4	145
Rhode Island	0	0	10	67	0	0	0	0	22
Connecticut	0	0	130	167	0	0	0	0	61
Middle Atlantic States:									
New York	3	1	1,017	1,052	0	4	3	4	404
New Jersey	0	0	167	239	0	0	1	1	163
Pennsylvania	1	0	514	785	0	0	6	1	223
East North Central States:									
Ohio	1	4	317	308	13	1	1	6	82
Indiana	0	1	166	264	48	5	2	0	38
Illinois	1	2	601	874	35	21	3	10	94
Michigan [2]	0	0	596	828	19	0	8	6	228
Wisconsin	0	0	172	407	4	7	1	4	140
West North Central States:									
Minnesota	0	0	135	160	20	9	1	0	27
Iowa	0	0	285	322	36	25	1	0	23
Missouri	0	0	250	456	54	76	2	3	57
North Dakota	0	0	29	30	13	17	0	0	29
South Dakota	0	0	16	48	6	0	0	0	19
Nebraska	0	0	25	106	8	11	0	0	6
Kansas	0	0	189	442	14	59	1	1	136
South Atlantic States:									
Delaware	0	0	27	6	0	0	1	0	10
Maryland [3]	0	0	109	47	0	0	0	2	70
District of Columbia	0	0	18	17	0	0	0	1	11
Virginia	3	1	50	17	0	0	2	3	80
West Virginia	0	0	68	39	0	0	2	11	53
North Carolina	0	1	41	40	1	1	2	1	473
South Carolina [3]	0	0	1	6	0	1	1	4	56
Georgia [3]	0	1	11	22	6	0	6	2	104
Florida	0	0	6	10	1	0	2	3	7

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 19, 1938, and Mar. 20, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938
East South Central States:									
Kentucky	0	0	100	46	19	0	2	6	37
Tennessee [3]	1	1	55	24	4	0	2	1	53
Alabama	1	0	15	10	0	0	4	1	31
Mississippi [2]	1	0	3	6	3	0	1	1	--------
West South Central States:									
Arkansas	1	0	10	10	5	2	7	1	23
Louisiana [3]	0	1	11	13	3	4	33	4	20
Oklahoma [4]	1	1	27	--------	14	15	0	4	64
Texas [3]	0	1	96	125	23	5	15	14	312
Mountain States:									
Montana	0	0	21	35	9	20	0	2	60
Idaho	0	0	22	40	17	2	0	1	28
Wyoming	0	0	10	40	0	0	0	0	3
Colorado	1	0	57	67	8	4	1	1	13
New Mexico	0	1	33	22	0	0	2	3	51
Arizona	0	0	5	16	14	0	2	0	20
Utah [2]	0	0	47	35	1	0	0	0	38
Pacific States:									
Washington	1	0	47	35	43	10	2	2	188
Oregon [5]	0	1	55	39	29	38	2	0	28
California	6	0	239	236	44	18	8	4	523
Total	22	17	6,205	7,900	514	355	129	112	4,364
First 11 weeks of year	238	228	67,405	73,363	6,198	3,297	1,302	1,213	44,995

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 19, 1938, 15 cases, as follows: South Carolina, 1; Georgia, 10; Tennessee, 1; Louisiana, 1; Texas, 2.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.
[5] Rocky Mountain spotted fever, week ended Mar. 19, 1937, Oregon, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February 1938										
Alabama	32	56	1,196	44	2,827	24	2	67	3	14
Colorado	2	51	9	--------	1,547	--------	1	204	32	2
Georgia	6	43	650	100	3,098	31	2	58	2	13
Idaho	1	2	29	--------	9	--------	3	78	99	3
Illinois	8	133	126	13	23,375	--------	2	2,871	151	23
Massachusetts	8	11	--------	1	811	--------	0	1,213	0	5
Michigan	9	69	7	--------	10,480	--------	4	2,303	51	51
Minnesota	5	13	11	--------	153	--------	1	671	95	1
Mississippi	5	36	8,023	1,035	1,426	216	9	31	17	3
Missouri	9	79	693	7	4,335	2	3	819	157	18
New Mexico	2	16	19	1	409	1	2	98	0	17
New York	32	137	--------	6	4,102	--------	2	3,030	0	17
North Carolina	11	105	123	20	7,966	15	4	172	4	12
North Dakota	2	4	15	--------	58	--------	0	122	74	0
Ohio	17	113	105	--------	8,148	--------	1	1,469	123	11
Oregon	4	14	299	--------	74	--------	3	288	88	2
Tennessee	15	48	593	5	3,500	8	1	168	55	6

Summary of monthly reports from States—Continued

February 1938

	Cases
Anthrax:	
Massachusetts	1
Ohio	2
Chickenpox:	
Alabama	323
Colorado	324
Georgia	366
Idaho	126
Illinois	2, 252
Massachusetts	1, 608
Michigan	2, 051
Minnesota	666
Mississippi	1, 553
Missouri	359
New Mexico	130
New York	3, 058
North Carolina	1, 022
North Dakota	167
Ohio	2, 283
Oregon	338
Tennessee	247
Conjunctivitis:	
Georgia	5
Idaho	3
New Mexico	2
Dengue:	
Mississippi	3
Diarrhea:	
Ohio (under 2 years; enteritis included)	19
Dysentery:	
Georgia (amoebic)	4
Georgia (bacillary)	9
Illinois (amoebic)	3
Illinois (amoebic carriers)	11
Illinois (bacillary)	15
Massachusetts (bacillary)	6
Michigan (amoebic)	6
Minnesota (amoebic)	10
Mississippi (amoebic)	86
Mississippi (bacillary)	185
Missouri (amoebic)	1
New Mexico (amoebic)	1
New Mexico (bacillary)	1
New York (amoebic)	3
New York (bacillary)	52
Ohio (amoebic)	1
Ohio (bacillary)	2
Tennessee (amoebic)	2
Tennessee (bacillary)	4
Encephalitis, epidemic or lethargic:	
Alabama	3
Illinois	4
Michigan	3
Missouri	4
New Mexico	1
New York	13
Oregon	1
German measles:	
Alabama	51
Idaho	8
Illinois	191
Massachusetts	80
Michigan	225
New Mexico	5
New York	146
North Carolina	31
North Dakota	63
Ohio	39
Tennessee	8
Hookworm disease:	
Georgia	3, 181
Mississippi	580
Impetigo contagiosa:	
Illinois	24
Oregon	70
Tennessee	1
Jaundice, infectious:	
Michigan	1
Oregon	4
Lead poisoning:	
Ohio	5
Mumps:	
Alabama	141
Colorado	33
Georgia	211
Idaho	237
Illinois	1, 094
Massachusetts	777
Michigan	1, 603
Mississippi	377
Missouri	318
New Mexico	55
North Dakota	6
Ohio	697
Oregon	66
Tennessee	230
Ophthalmia neonatorum:	
Illinois	3
Massachusetts	94
Mississippi	6
New York [1]	9
North Carolina	1
Ohio	67
Tennessee	3
Paratyphoid fever:	
Idaho	1
Illinois	1
Massachusetts	1
Michigan	1
New York	2
North Carolina	2
Puerperal septicemia:	
Mississippi	26
New Mexico	2
Ohio	1
Rabies in animals:	
Alabama	63
Illinois	36
Massachusetts	9
Michigan	8
Mississippi	22
Missouri	9
New Mexico	1
New York [1]	5
Oregon	6
Scabies:	
Oregon	82
Septic sore throat:	
Georgia	50
Idaho	40
Illinois	12
Massachusetts	21
Michigan	30
Minnesota	9
Missouri	45
New Mexico	9
New York	152
North Carolina	16
Ohio	113
Oregon	12
Tennessee	13
Tetanus:	
Alabama	3
Georgia	1
Illinois	1
Michigan	1
Missouri	1
New York	1
Trachoma:	
Idaho	2
Illinois	40
Missouri	35
Tennessee	1
Trichinosis:	
Massachusetts	4
Michigan	3
New York	18
Ohio	7
Tularaemia:	
Alabama	2
Georgia	10
Illinois	4
Minnesota	1
Missouri	3
North Carolina	1
North Dakota	1
Ohio	2
Typhus fever:	
Alabama	10
Georgia	26
New York	2
North Carolina	1
Undulant fever:	
Alabama	3
Georgia	4
Idaho	2
Illinois	7
Massachusetts	3
Michigan	15
Minnesota	2
Mississippi	4
New Mexico	1
New York	8
North Carolina	2
Ohio	7
Oregon	4
Tennessee	1
Vincent's infection:	
Idaho	1
Illinois	8
Michigan	18
New York [1]	122
North Carolina	1
North Dakota	11
Oregon	20
Tennessee	3
Whooping cough:	
Alabama	83
Colorado	41
Georgia	223
Idaho	53
Illinois	367
Massachusetts	454
Michigan	757
Minnesota	147
Mississippi	878
Missouri	375
New Mexico	146
New York	1, 797
North Carolina	1, 371
North Dakota	124
Ohio	492
Oregon	124
Tennessee	224

[1] Exclusive of New York City.

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 12, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	195	703	130	6,264	980	2,569	25	409	19	1,336	--------
Current week [1]	168	128	52	15,830	726	1,943	33	429	16	1,199	--------
Maine:											
Portland	0	------	0	3	4	0	0	0	0	23	21
New Hampshire:											
Concord	0	------	0	1	1	0	0	2	0	5	13
Manchester	0	------	2	2	2	3	0	2	0	0	19
Nashua	0	------	0	0	1	0	0	0	0	0	9
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	2
Burlington	0	------	0	9	0	1	0	0	0	4	9
Rutland	0	------	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	0	------	0	128	20	110	0	5	0	23	234
Fall River	0	------	0	0	0	0	0	1	0	6	30
Springfield	0	------	0	3	7	0	0	1	0	18	42
Worcester	0	------	0	8	6	25	0	3	0	4	63
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	13
Providence	20	------	0	2	12	0	0	0	0	28	68
Connecticut:											
Bridgeport	0	------	0	0	2	24	0	2	0	0	37
Hartford	0	------	0	3	3	24	0	2	1	1	51
New Haven	0	3	0	2	4	1	0	0	0	9	30
New York:											
Buffalo	0	------	1	4	0	43	0	12	0	18	169
New York	30	10	8	862	154	387	0	82	4	208	1,622
Rochester	0	2	0	3	4	19	0	1	0	6	66
Syracuse	0	------	0	26	6	7	0	2	0	9	72
New Jersey:											
Camden	1	1	1	40	3	5	0	3	0	1	28
Newark	0	------	0	10	11	12	0	5	0	32	133
Trenton	0	1	0	2	4	8	0	2	0	4	30
Pennsylvania:											
Philadelphia	10	12	5	759	43	129	0	17	1	41	537
Pittsburgh	4	3	1	347	19	39	0	6	1	15	156
Reading	0	------	0	4	1	2	0	0	0	6	17
Scranton	1	------	--------	54	------	7	0	------	0	4	--------
Ohio:											
Cincinnati	1	2	1	1	8	19	0	7	0	11	147
Cleveland	1	18	0	351	13	76	0	10	2	52	180
Columbus	1	2	2	220	9	7	0	5	0	0	99
Toledo	0	------	0	105	5	16	1	3	0	29	68
Indiana:											
Anderson	0	------	0	51	0	3	1	0	0	2	10
Fort Wayne	0	------	0	106	0	17	1	1	0	3	31
Indianapolis	7	------	3	186	20	17	0	5	0	11	122
Muncie	0	------	0	0	3	0	0	3	0	0	17
South Bend	0	------	0	23	0	2	1	1	0	0	9
Terre Haute	0	------	0	25	0	5	2	0	0	0	13
Illinois:											
Alton	1	------	0	0	2	2	0	0	0	0	7
Chicago	8	3	2	3,478	50	246	1	37	2	46	702
Elgin	1	------	0	2	2	8	0	0	0	2	15
Moline	0	------	0	40	2	14	0	0	0	0	10
Springfield	0	------	0	286	0	7	0	0	0	2	16
Michigan:											
Detroit	9	1	1	3,027	8	188	0	15	0	77	247
Flint	1	------	0	5	7	52	0	1	0	28	27
Grand Rapids	0	------	0	66	3	13	0	0	0	3	31
Wisconsin:											
Kenosha	0	------	0	17	0	3	0	0	0	0	7
Madison	0	------	0	15	0	4	0	0	0	8	28
Milwaukee	1	------	0	3,679	8	24	1	3	0	25	120
Racine	0	------	0	39	0	14	0	0	0	13	15
Superior	0	------	0	8	3	1	0	0	0	0	11

[1] Figures for Wilmington, N. C., estimated; report not received.

City reports for week ended Mar. 12, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	1	2	0	1	0	4	18
Minneapolis	0	------	2	20	7	32	3	2	0	3	96
St. Paul	0	3	3	2	4	13	3	1	0	2	65
Iowa:											
Cedar Rapids	0	------	------	0	------	3	1	------	0	1	------
Davenport	0	------	------	3	------	0	0	------	0	0	------
Des Moines	0	------	------	2	------	27	1	------	0	0	41
Sioux City	0	------	------	0	------	3	0	------	0	0	------
Waterloo	0	------	------	40	------	7	0	------	0	0	------
Missouri:											
Kansas City	1	1	2	261	14	19	0	4	0	4	102
St. Joseph	1	------	0	47	3	0	0	0	0	0	28
St. Louis	8	------	0	21	13	100	0	7	0	8	225
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	11	4
Grand Forks	0	------	------	3	------	2	0	------	0	0	------
Minot	0	------	0	0	0	2	9	0	0	0	4
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	5	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	10
Nebraska:											
Omaha	0	------	0	7	9	4	0	1	0	1	65
Kansas:											
Lawrence	0	3	0	0	0	0	0	0	0	0	6
Topeka	0	------	1	15	1	2	0	0	0	20	20
Wichita	0	------	0	0	2	1	0	1	0	4	28
Delaware:											
Wilmington	0	------	0	14	6	2	0	1	0	1	37
Maryland:											
Baltimore	4	9	3	12	22	39	0	7	0	33	241
Cumberland	0	------	0	3	0	5	0	1	0	4	14
Frederick	0	------	0	0	0	0	0	1	0	0	5
Dist. of Col.:											
Washington	9	------	0	12	20	24	0	8	0	5	175
Virginia:											
Lynchburg	0	------	0	1	1	1	0	0	0	2	13
Norfolk	0	------	0	73	1	11	0	0	0	5	18
Richmond	0	------	1	18	2	3	0	4	0	0	62
Roanoke	1	------	0	0	1	2	0	0	0	0	14
West Virginia:											
Charleston	1	3	1	60	5	2	0	0	1	2	28
Huntington	1	------	------	30	------	1	0	------	0	0	------
Wheeling	0	------	0	110	2	8	0	0	0	9	21
North Carolina:											
Gastonia	0	------	------	9	------	0	0	------	0	9	------
Raleigh	0	------	0	50	0	0	0	0	0	20	10
Wilmington	------	------	------	------	------	------	------	------	------	------	------
Winston-Salem	2	------	0	3	2	0	0	1	0	38	12
South Carolina:											
Charleston	0	22	0	25	4	0	0	0	0	0	23
Florence	0	------	0	10	4	1	0	0	0	0	9
Greenville	0	------	0	1	2	1	0	1	0	11	24
Georgia:											
Atlanta	0	6	0	132	12	5	1	8	0	7	106
Brunswick	0	------	0	0	1	0	0	0	0	0	5
Savannah	1	------	0	34	3	0	0	1	0	0	28
Florida:											
Miami	0	------	0	61	5	2	0	3	0	6	36
Tampa	2	1	1	6	3	2	0	1	0	0	26
Kentucky:											
Ashland	0	------	0	1	0	0	0	0	0	0	0
Covington	0	------	0	0	0	0	0	1	0	4	14
Lexington	0	------	0	0	3	0	0	1	0	0	18
Louisville	4	5	0	254	11	50	0	5	0	8	96
Tennessee:											
Knoxville	1	10	2	54	2	2	0	2	0	1	33
Memphis	0	------	3	63	10	2	0	8	1	1	95
Nashville	0	------	4	160	7	3	0	5	0	6	62
Alabama:											
Birmingham	1	2	4	190	8	1	0	3	0	1	74
Mobile	0	------	2	25	4	0	0	3	0	1	28
Montgomery	0	1	0	81	------	0	0	------	0	2	------
Arkansas:											
Fort Smith	0	------	------	13	------	0	0	------	0	0	------
Little Rock	0	------	0	55	2	1	0	1	0	0	------

City reports for week ended Mar. 12, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	1	1	0	1	0	0	3	5
New Orleans	1	6	0	0	7	11	0	12	0	14	134
Shreveport	1	------	0	11	10	0	0	2	2	0	37
Oklahoma:											
Muskogee	0	------	------	0	------	0	0	------	0	0	------
Oklahoma City	1	------	0	0	7	5	0	3	0	0	59
Tulsa	2	------	------	15	------	3	9	------	0	8	------
Texas:											
Dallas	3	1	1	2	7	13	0	3	0	3	68
Fort Worth	1	------	1	3	4	6	0	2	0	6	45
Galveston	0	------	0	0	2	0	0	1	0	0	17
Houston	1	1	0	3	15	4	0	6	1	0	100
San Antonio	19	------	0	0	12	1	0	8	0	0	64
Montana:											
Billings	0	------	0	1	1	0	0	1	0	1	11
Great Falls	0	------	0	1	3	2	3	0	0	5	14
Helena	0	------	0	1	1	0	0	0	0	0	4
Missoula	0	------	0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	1	2	0	0	0	8
Colorado:											
Colorado Springs	0	------	0	1	0	7	0	0	0	1	9
Denver	4	------	2	486	9	20	0	4	0	2	95
Pueblo	0	------	0	0	3	5	1	0	0	5	13
New Mexico:											
Albuquerque	1	------	1	7	1	0	0	3	0	1	20
Utah:											
Salt Lake City	0	------	0	178	5	12	0	1	0	6	45
Washington:											
Seattle	1	------	3	2	3	5	0	1	0	57	96
Spokane	0	------	0	1	4	1	9	1	0	23	41
Tacoma	0	------	0	0	2	8	1	1	0	24	28
Oregon:											
Salem	0	2	------	0	------	0	1	------	1	0	------
California:											
Los Angeles	10	13	0	13	25	47	4	18	0	9	411
Sacramento	0	------	0	6	5	1	0	3	0	50	26
San Francisco	3	2	0	1	7	13	0	10	0	65	189

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Rhode Island:				District of Columbia:			
Providence	1	0	0	Washington	0	1	0
New York:				Georgia:			
Buffalo	4	2	0	Savannah	1	1	0
New York	3	0	2	Kentucky:			
New Jersey:				Louisville	0	1	0
Newark	1	1	0	Tennessee:			
Ohio:				Nashville	0	1	0
Cincinnati	2	2	0	Louisiana:			
Illinois:				New Orleans	4	0	0
Chicago	1	0	0	California:			
Missouri:				Sacramento	1	0	0
Kansas City	1	1	0	San Francisco	1	0	0
St. Louis	1	0	0				
Maryland:							
Baltimore	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Cleveland, 1; Detroit, 1; Milwaukee, 2; Baltimore, 1.
Pellagra.—Cases: Atlanta, 2; Birmingham, 4; Dallas, 1; San Antonio, 1; San Francisco, 1.
Smallpox.—Deaths: Superior, 1.
Typhus fever.—Cases: New York, 1.

FOREIGN AND INSULAR

CHINA

Shanghai—Cerebrospinal meningitis.—During the week ended March 12, 1938, 47 cases of cerebrospinal meningitis with 8 deaths were reported in two foreign settlements of Shanghai, China.

CUBA

Provinces—Notifiable diseases—4 weeks ended February 5, 1938.—During the 4 weeks ended February 5, 1938, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		1	7		3	12
Chickenpox	4	4		1	1		10
Diphtheria	4	16	3	5	3		31
Hookworm disease		56					56
Leprosy						6	6
Malaria	14	11	12	77	7	150	271
Measles	23	35	7			6	71
Poliomyelitis	1	1	1			2	5
Tetanus, infantile				1			1
Tuberculosis	32	33	28	50	49	35	227
Typhoid fever	11	60	2	34	4	35	146
Whooping cough		16		16			32
Yaws						5	5

GERMANY

Hamburg—Elmshorn—Psittacosis.—During the period December 11, 1937, to the end of February 1938, 14 cases of psittacosis with 2 deaths were reported in Elmshorn and Hamburg, Germany. It was stated that the local board of health had reported infected parrakeets to have been traced to Elmshorn, a small town near Hamburg, and to bird dealers in Hamburg and Schleswig-Holstein.

ITALY

Communicable diseases—4 weeks ended January 2, 1938.—During the 4 weeks ended January 2, 1938, cases of certain communicable diseases were reported in Italy as follows:

Disease	Dec. 6-12	Dec. 13-19	Dec. 20-26	Dec. 27, 1937-Jan. 2, 1938
Anthrax	23	12	4	21
Cerebrospinal meningitis	14	14	15	13
Chickenpox	365	465	351	253
Diphtheria	817	826	750	663
Dysentery	28	51	21	26
Hookworm disease	5	9	5	7
Lethargic encephalitis	4	2	1	1
Measles	1,292	1,873	1,257	1,438
Mumps	202	224	178	121
Paratyphoid fever	75	64	54	44
Poliomyelitis	22	29	23	17
Puerperal fever	41	58	29	42
Scarlet fever	328	296	290	225
Typhoid fever	482	474	402	312
Undulant fever	25	29	33	42
Whooping cough	288	265	181	187

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for March 25, 1938, pages 470-483. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Bassein.—During the week ended March 12, 1938, 1 fatal case of cholera was reported in Bassein, India.

Plague

Belgian Congo.—On March 15, 1938, 1 case of plague was reported in Kwandruma, and 3 cases of plague were reported in Lisasi, Belgian Congo.

Ecuador—Chimborazo Province—Chimbo.—During the week ended March 5, 1938, 10 cases of plague were reported in Chimbo, Chimborazo Province, Ecuador.

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on March 9, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, has been proved positive for plague.

Peru.—During the month of January 1938, plague was reported in Peru as follows: Lambayeque Department, 1 case, 1 death; Lima Department, 6 cases, 5 deaths.

Smallpox

British North Borneo—Sandakan.—During the week ended February 12, 1938, 1 case of smallpox was reported in Sandakan, British North Borneo.

Great Britain—England and Wales.—During the week ended March 5, 1938, 1 case of smallpox was reported in Leighton Buzzard, and 1 case in Bedford County, England.

On vessel—City of Auckland.—On March 5, 1938, 1 case of smallpox was reported on the *S. S. City of Auckland* at Halifax, Nova Scotia. The vessel sailed from Calcutta on January 18, 1938. The report stated that all precautionary measures had been taken.

Typhus Fever

Mexico.—During the month of January 1938, typhus fever was reported in Mexico as follows: Aguascalientes, Aguascalientes State, 13 cases, 1 death; Mexico State, 8 cases, 1 death; Mexico, D. F., 27 cases, 5 deaths, Oaxaca State, 1 case; San Luis Potosi, San Luis Potosi State, 5 cases, 4 deaths.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Federal District, February 17, 1 death; February 28, 1 death. Minas Geraes State—January 30 to March 1, 53 deaths. Rio de Janeiro State—January 28 to February 21, 6 cases, 8 deaths. Sao Paulo State—Presidente Wenceslau, January 1938, 14 cases.

Ivory Coast—Agboville.—On March 12, 1938, 1 suspected case of yellow fever was reported in Agboville, Ivory Coast.

Nigeria—Ijebuode.—During the week ended January 29, 1938, 1 suspected case of yellow fever with 1 death was reported in Ijebuode, Nigeria.

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